

What is claimed is:

1. A process for coproducing butene oligomers and tert-butyl ethers from isobutenic C₄ streams by
 - 5 a) partly oligomerizing the isobutenic C₄ streams over an acidic catalyst to give butene oligomers and subsequently
 - b) etherifying the remaining isobutene with an alcohol under acidic catalysis to give tert-butyl ethers,
 - 10 which comprises carrying out the etherification under acid catalysis in stage b) in at least two reaction stages, of which at least the last reaction stage
 - 15 is carried out as a reactive distillation.
2. The process as claimed in claim 1,
wherein
the acidic catalyst used in stage a) is an ion exchanger whose protons have partly been exchanged for metal ions of groups 1 to 12 of the Periodic Table.
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3. The process as claimed in claim 2,
wherein
from 1 to 60% of the protons of the ion exchanger used in stage a) have been exchanged for metal ions.
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- 30 4. The process as claimed in any of claims 1 to 3,
wherein
the oligomerization in stage a) is carried out up to an isobutene conversion of from 50 to 95%.
- 35 5. The process as claimed in any of claims 1 to 4,
wherein
the oligomerization in stage a) is carried out in the presence of a moderator.

6. The process as claimed in claim 5,
wherein
the moderator used is MTBE, TBA, methanol or water
in a molar ratio of from 0.01 to 5 per mole of
5 isobutene.
7. The process as claimed in any of claims 1 to 6,
wherein
the butene oligomers obtained in stage a) are
10 removed before the acid-catalyzed etherification
in stage b).
8. The process as claimed in any of claims 1 to 7,
wherein
15 the alcohol used in stage b) is methanol or
ethanol.
9. The process as claimed in any of claims 1 to 8,
wherein
20 the polyunsaturated hydrocarbons contained in the
isobutenic C₄ streams are catalytically
hydrogenated before the oligomerization in stage
a).
- 25 10. The process as claimed in claim 9,
wherein
the polyunsaturated compounds are hydrogenated in
at least two reaction stages, of which at least
the last reaction stage is carried out in the
30 presence of 0.05 - 100 ppm by weight of CO.
11. The process as claimed in any of claims 1 to 10,
wherein
more than 90% of the butene oligomers obtained in
35 stage a) are isobutene oligomers.